A Note on the Implicit Interest Rate on Demand Deposits

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Abstract:

This paper examines the significance of several estimated measures of the implicit interest rate on demand deposits in an annual demand-for-money function. The evidence demonstrates that the coefficient estimates of the implicit interest rate are not positive and statistically significant as predicted due to the scarcity of data points and the high collinearity with other opportunity cost variables.

Article:

1. Introduction

There have been numerous attempts to estimate the impact of some measure of the implicit rate of return on demand deposits or money balances on the demand for money. Initially, the negative of the bank service charge was employed as the rate of return on demand deposits.[1] Barro and Santomero (1972) and Klein (1974), however, objected that while fixed charges raise total transaction costs, marginal transaction costs are unaffected, so that behavior is unchanged. Noting that the marginal return on demand deposits or money balances is the appropriate interest rate to include in the money demand function, these authors tested separate estimates of the marginal return.[2] Based on a survey of commercial banks, Barro and Santomero estimated the value of free services rendered to demand deposits holders and used it as a measure of the marginal return on demand deposits in a household money demand study. Klein, on the other hand, computed a marginal return on money by assuming that competition in banking distributes all "excess" profits to depositors in the form of the value of these services.[3]

Another approach has been to measure the average return on demand deposits from bank cost data. Becker (1975, p. 73) calculated "the yearly difference between the reported aggregate non-interest expenses of all Federal Reserve System member banks per dollar of demand deposits less service charges and fees per dollar of demand deposits as the index of the net rate of return on demand deposits." In another study, Startz (1979) used data on the cost of servicing demand deposits from the Functional Cost Analysis program of the Federal Reserve Banks to compute an implicit interest rate on demand deposits for 1959-76. This note reexamines the statistical significance of the implicit interest rate measures.

2. The Empirical Results

The long-run money demand function to be estimated is

$$\log M = a_o + a_1 \log y_p + a_2 r_s + a_3 r_L + a_4 r_D + u_t \qquad (1)$$

where M is real per capita currency plus demand deposits; y_P is real permanent per capita income; r_s is the four-six month commercial paper rate; r_L, is the yield on corporate bonds; r_D is the implicit return on demand deposits for Barro and Santomero (SB), Becker (B), or Startz (S); and u_t is the error term which is assumed to be first-order serially correlated.[4] The expected signs are $a_1, a_4 > 0$ and $a_2, a_3 < 0$.

Equation (1) is initially estimated over the time period common to all three series (1954-68) and reported as Equations (1.1)—(1.3) in Table 1. The coefficients on the implicit return on demand deposits are insignificant

in each case.[5] Because these regressions have only ten degrees of freedom, separate results are also presented that use the entire time series for each measure [see Equations (1.4) and (1.9)]. The results are reported with either a_2 or a_3 constrained to be zero to lessen the multicollinearity problem, but the r_D coefficients are insignificant in each case.[6] Similar results, which are not reported, were obtained when equations reported in Table 1 were estimated with real per capita demand deposits as the dependent variable and real per capita income as the scale variable. The reason that the implicit return coefficients are insignificant and sometime display the incorrect sign is that the variable is highly correlated (over 83%) with both the short-term and long-term interest rates and serves as a proxy variable for interest rates when it is the only opportunity cost variable.[7] The combination of a high correlation with both the interest rates and the small sample size yields imprecise estimates of the implicit return coefficient. [8]

TABLE 1. *Demand for Money with the Implicit Interest Rate**

	a_0	a_1	a_2	a_3	a_4	$\overline{R^2}$	ρ	DW	SE
1954–68									
(1.1) SB	−15.71	1.42	−0.002	0.012	−0.151	0.73	0.94	2.29	0.0102
	(7.45)	(4.64)	(0.47)	(0.96)	(2.02)				
(1.2) B	−10.68	0.68	0.006	−0.012	0.045	0.64	0.92	2.23	0.0113
	(7.45)	(3.29)	(1.15)	(1.08)	(1.35)				
(1.3) S	−12.37	0.92	0.003	−0.008	−0.010	0.60	0.94	2.36	0.0122
	(7.84)	(4.23)	(0.57)	(0.43)	(0.18)				
1950–68									
(1.4) SB	−14.30	1.20	−0.002	—	−0.074	0.65	0.95	2.23	0.0105
	(8.09)	(4.77)	(0.48)		(1.72)				
(1.5)	−13.85	1.14	—	0.003	−0.076	0.65	0.95	2.26	0.0106
	(9.07)	(5.25)		(0.32)	(1.54)				
1952–70									
(1.6) B	−14.06	1.06	0.000	—	0.017	0.69	0.97	2.47	0.0104
	(9.04)	(5.09)	(0.03)		(0.76)				
(1.7)	−13.55	1.03	—	−0.008	0.026	0.70	0.96	2.28	0.0100
	(10.77)	(6.04)		(1.08)	(1.04)				
1954–74									
(1.8) S	−13.39	1.05	−0.002	—	−0.015	0.73	0.95	2.27	0.0101
	(11.30)	(6.62)	(0.73)		(1.31)				
(1.9)	−13.01	1.00	—	—	−0.018	0.72	0.95	2.14	0.0100
	(12.38)	(7.15)			(1.72)				

*t-scores appear in parentheses.

SB and B only report evidence of a significantly negative coefficient on this variable when they estimate a variant of Equation (1). For example, Becker presents quarterly regression estimates of the currency to demand deposit ratio in which the r_D coefficient is significant with the expected negative sign. In estimating an annual household money demand equation, Barro and Santomero find that a variable which measures the difference between the savings and loan passbook rate (r_T) and the implicit interest rate on demand deposits is significant and has the expected negative sign.

TABLE 2. *Demand for Money with the Differential Interest Rate**

	a_0	a_1	a_2	a_3	a_4	$\overline{R^2}$	ρ	DW	SE
1954–68									
(2.1) SB	−11.78	0.82	—	0.001	−0.081	0.77	0.97	2.62	0.0089
	(8.28)	(4.57)		(0.08)	(2.85)				
(2.2) SB	−11.08	0.76	—	—	−0.090	0.82	0.96	2.48	0.0086
	(7.68)	(4.18)			(2.82)				
1954–70									
(2.3) B	−12.72	0.96	—	−0.004	−0.019	0.74	0.95	2.55	0.0097
	(10.07)	(5.60)		(0.64)	(1.73)				
(2.4) B	−13.15	0.99	—	—	−0.019	0.76	0.96	2.54	0.0095
	(10.42)	(5.97)			(1.75)				
1954–74									
(2.5) S	−13.34	1.06	—	−0.012	−0.012	0.73	0.95	2.25	0.0101
	(12.34)	(7.29)		(1.85)	(1.07)				
(2.6) S	−13.80	1.08	—	—	−0.002	0.70	0.96	2.32	0.0107
	(11.28)	(6.77)			(0.22)				

*t-scores appear in parentheses.

Therefore, Equation (1) is estimated with this variable $(r_T - r_D)$ substituted for r_D where the expected sign of a_4 is negative.[9] The results reported in Table 2 constrain either a_2 or a_2 and a_3 to be zero. The coefficient estimates

and significance levels for the implicit return variables are not altered if a_3 is constrained to zero or if both a_2 and a_3 remain unconstrained. The $(r_T - r_D)$ coefficient is only negative and significant for the SB equations reported in Table 2. The $(r_T - r_D)$ coefficient is nearly significant at the five percent level for a one-tailed test for the Becker equations, but it is insignificant in the Startz equations. The results, however, still suffer from multicollinearity when the r_s or r_L variable is included and from the lack of data points for all the results.

3. Summary

This note demonstrates that the coefficient estimates of the existing annual time series of the coefficient on the implicit interest rate on demand deposits are not significant in a long-run money demand function. The coefficient estimates for the differential rate between the return on savings and demand deposits, is negative and significant for only the SB variable for the 1950-68 period. All of these estimates are imprecise because they suffer from the high collinearity of the r_D variable with the other opportunity cost variables and the scarcity of data points for any one r_D series.

Notes:

[1] C.F. Selden (1956), Cagan (1958, 1965), Feige (1964, 1974), Lee (1967), Hamburger (1969) and Fry (1974).

[2] Santomero (1979) has argued that the fixed costs and the marginal return on marginal balances are complementary rather than competitive approaches. Therefore, both the fixed cost and marginal return should be considered in the individual's decision-making process to hold money in the long run, there are no fixed costs everything is variable so everything affects marginal cost. Fixed costs are assumed constant in this paper.

[3] Klein's measure of an implicit return on money, however, is not considered in this paper because Carlson and Frew (1980) have shown that it is an endogenous variable.

[4] The data is from Klein (1974) except for the individual r_D series published by the individual authors. The equations are corrected for autocorrelation by the Hildreth-Lu procedure to guarantee that a global minimum has been found for the standard error.

[5] A short-run money demand function which assumes only partial adjustment between actual and desired levels of money balances and includes a lagged dependent variable is also estimated for the regressions reported in Table 1. The r_D coefficients are insignificant in each case. The lagged dependent variable was never positive and significant which indicates complete adjustment of desired to actual money balances. In this respect, then, the long-run money demand equation is not misspecified.

[6] The r_D coefficients are also insignificant if neither a_2 or a_3 is constrained to be zero.

[7] The r_D coefficient is negative and nearly significant in Equations (1.4), (1.5), (1.8), and (1.9) if a_2 and a_3 are both constrained to be zero.

[8]Santomero has made a linear interpolation of the annual SB and B series and found a positive and significant coefficient for the r_D variable in a quarterly money demand function. His interpolation is not based upon the best linear unbiased interpolation procedure outlined by Chow and Lin (1971).

[9] The $(r_T - rp)$ series for Becker and Startz is computed by taking the annual average of the quarterly measures on the rate-on-time deposits provided by the St. Louis Federal Reserve Board for the 1954-1974 period and subtracting the Becker or Startz r_D series from it. The $(r_T - r_D)$ series for Barro and Santomero is found on p. 400.

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